

Supporting information

Deep oxidative desulfurization of fuels in presence of Brönsted acidic polyoxometalate-based ionic liquids

Argam Akopyan ¹, Ekaterina Eseva ¹, Polina Polikarpova ¹, Anastasia Kedalo ¹, Anna Vutolkina ^{1,2} and Aleksandr Glotov ^{1,2,*}

¹ Department of Petroleum Chemistry and Organic Catalysis, Moscow State University, 119991 Moscow, Russia; arvchem@yandex.ru (A.A.); polikarpova-polina@rambler.ru (P.P.); esevakatya@mail.ru (E.E.); nastya.kedalo@mail.ru (A.K.); annavutolkina@mail.ru (A.V.); glotov.a@gubkin.ru (A.G.)

² Department of Physical and Colloid Chemistry, Gubkin Russian State University of Oil and Gas, 119991 Moscow, Russia; annavutolkina@mail.ru (A.V.); glotov.a@gubkin.ru (A.G.)

* Correspondence: glotov.a@gubkin.ru

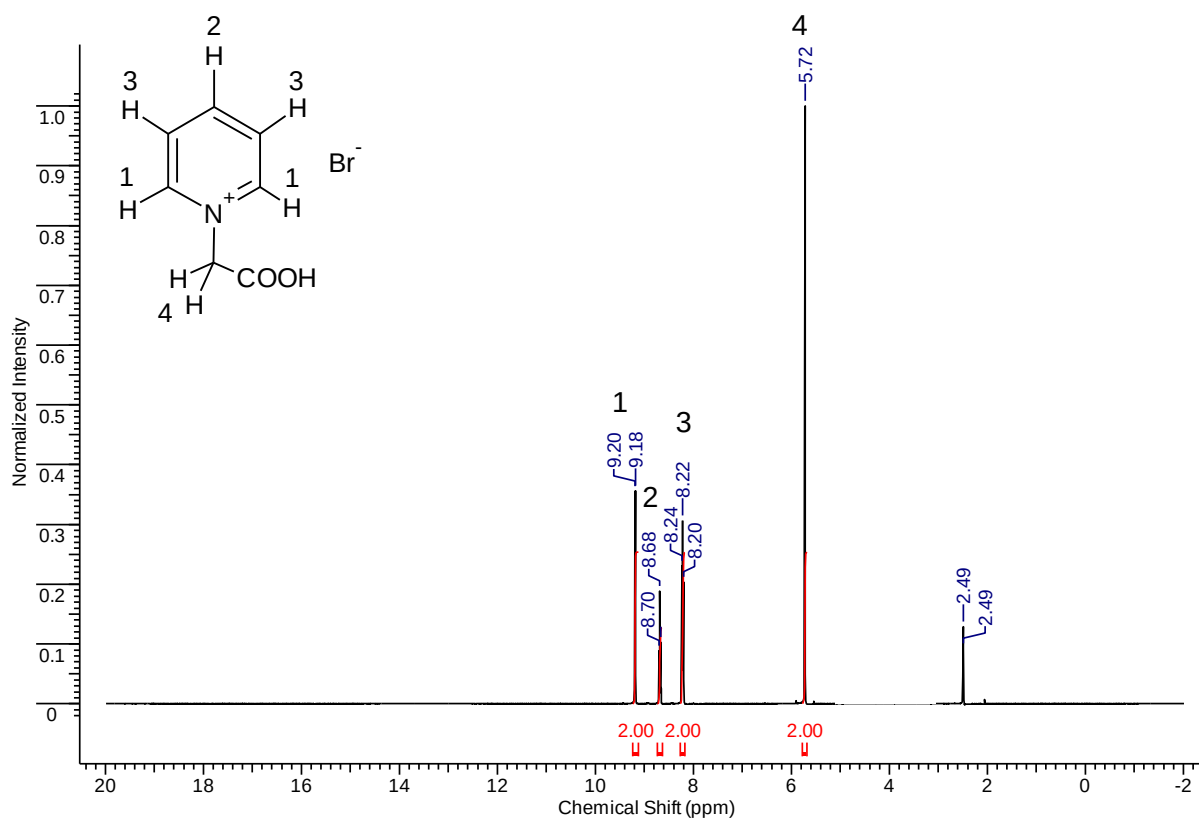


Figure 1. NMR H¹ spectra 1-(carboxymethyl) pyridinium bromide.

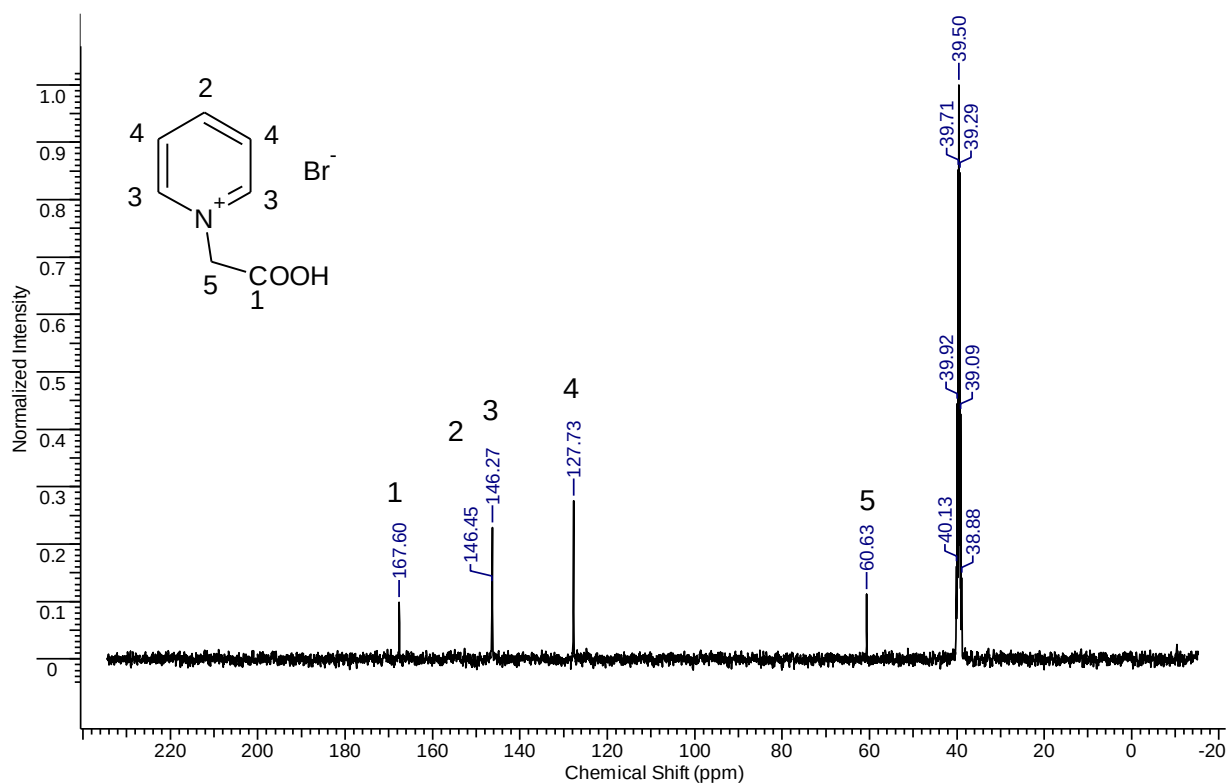


Figure 2. NMR C^{13} spectra 1-(carboxymethyl) pyridinium bromide.

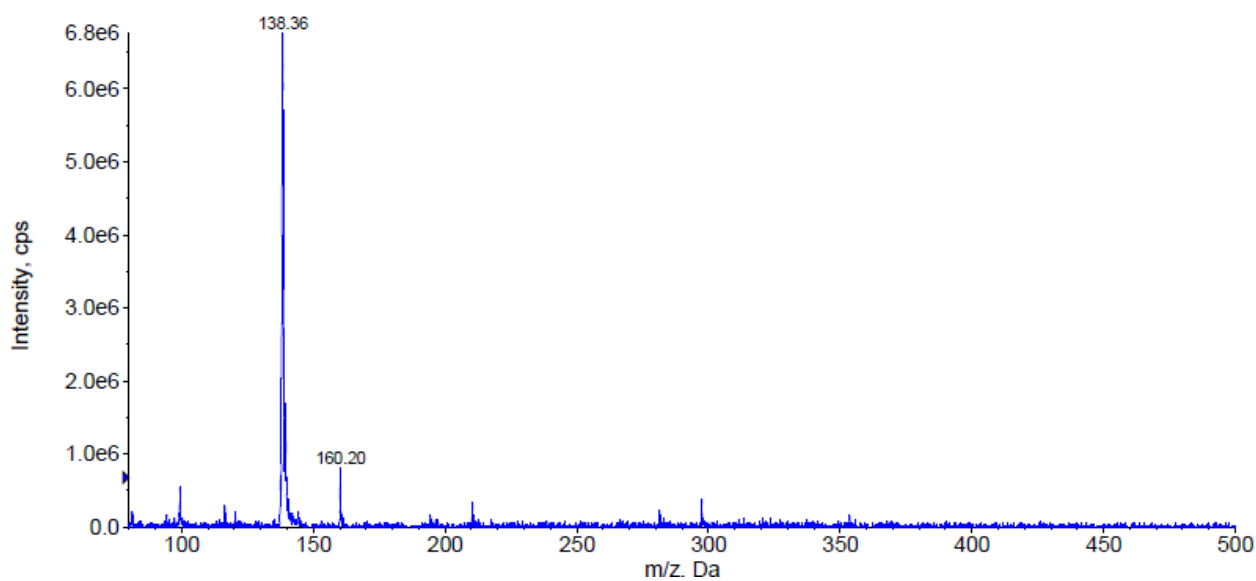


Figure 3. ESI-MS spectra 1-(carboxymethyl) pyridinium bromide.

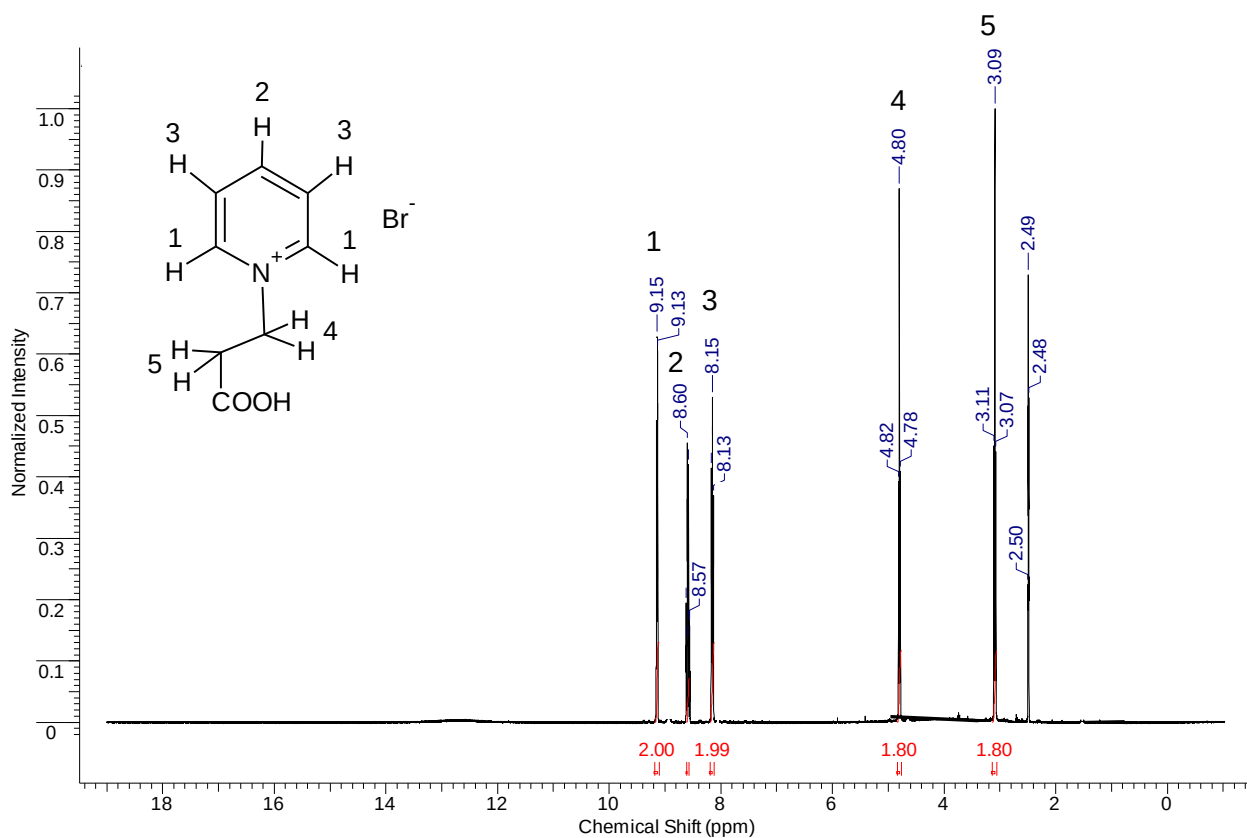


Figure 4. NMR ^1H spectra 1-(2-carboxyethyl) pyridinium bromide.

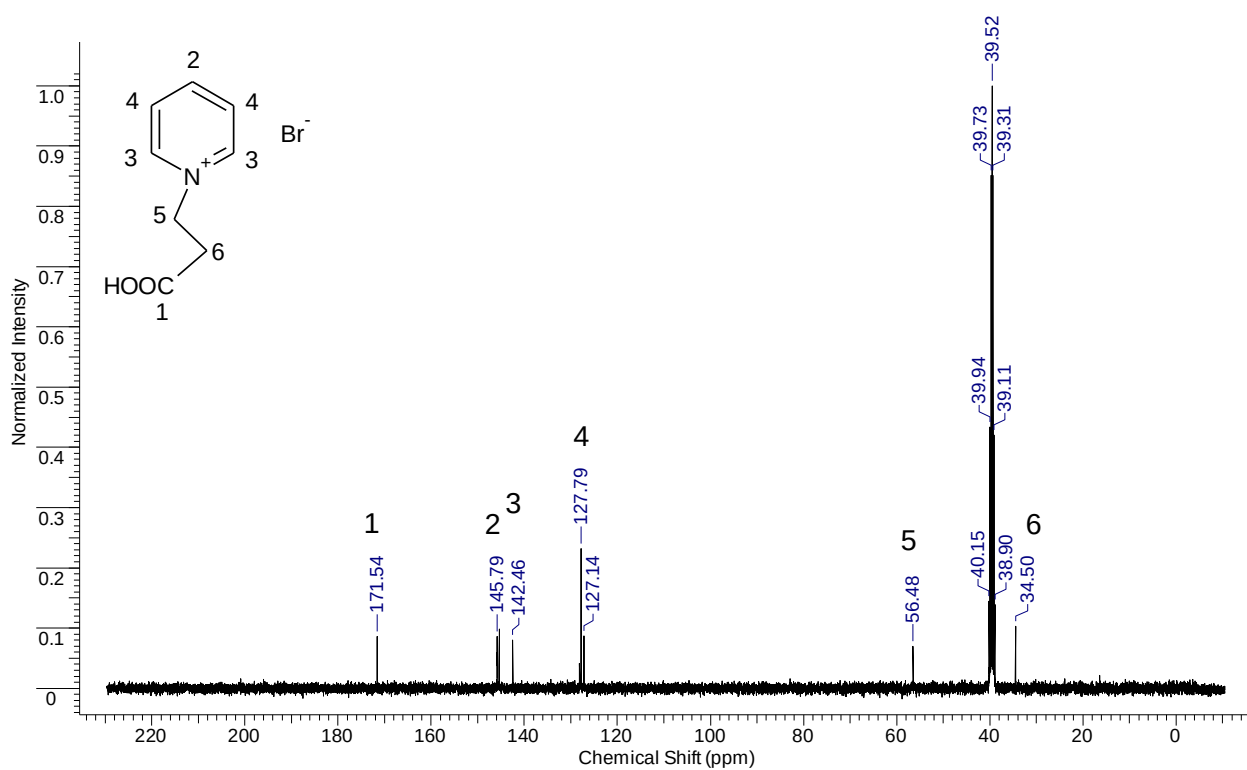


Figure 5. NMR ^{13}C spectra 1-(2-carboxyethyl) pyridinium bromide.

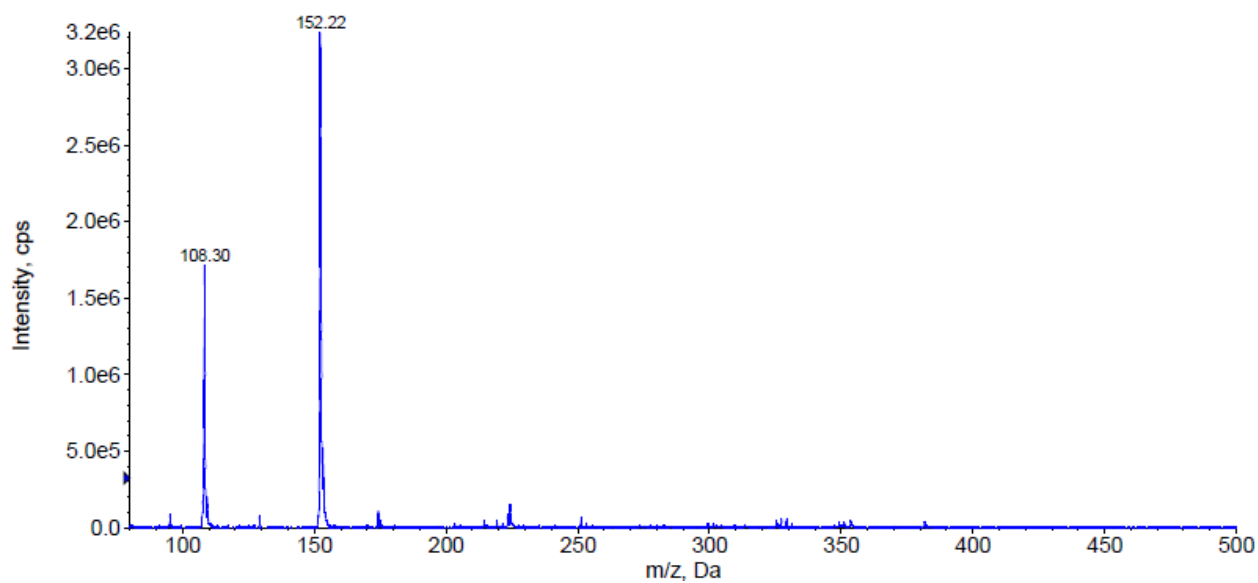


Figure 6. ESI-MS spectra 1-(2-carboxyethyl) pyridinium bromide.

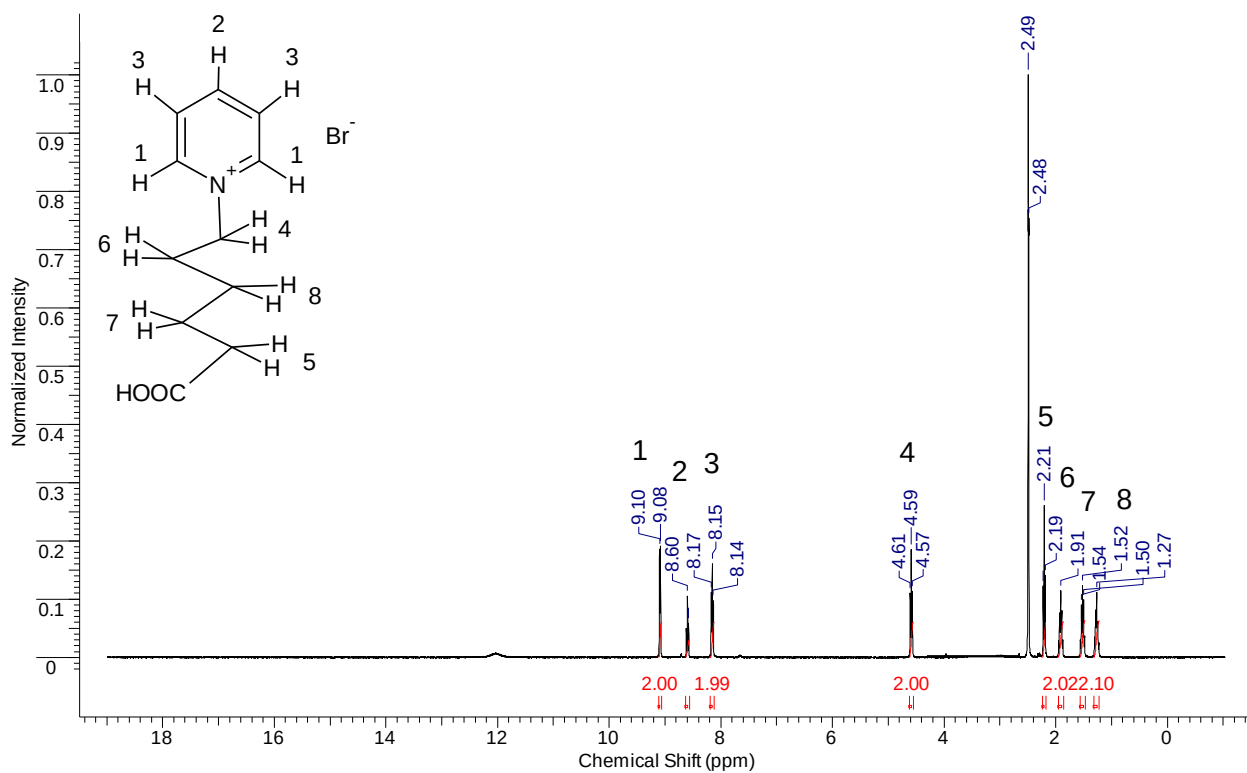


Figure 7. NMR ^1H spectra 1-(5-carboxypentyl) pyridinium bromide.

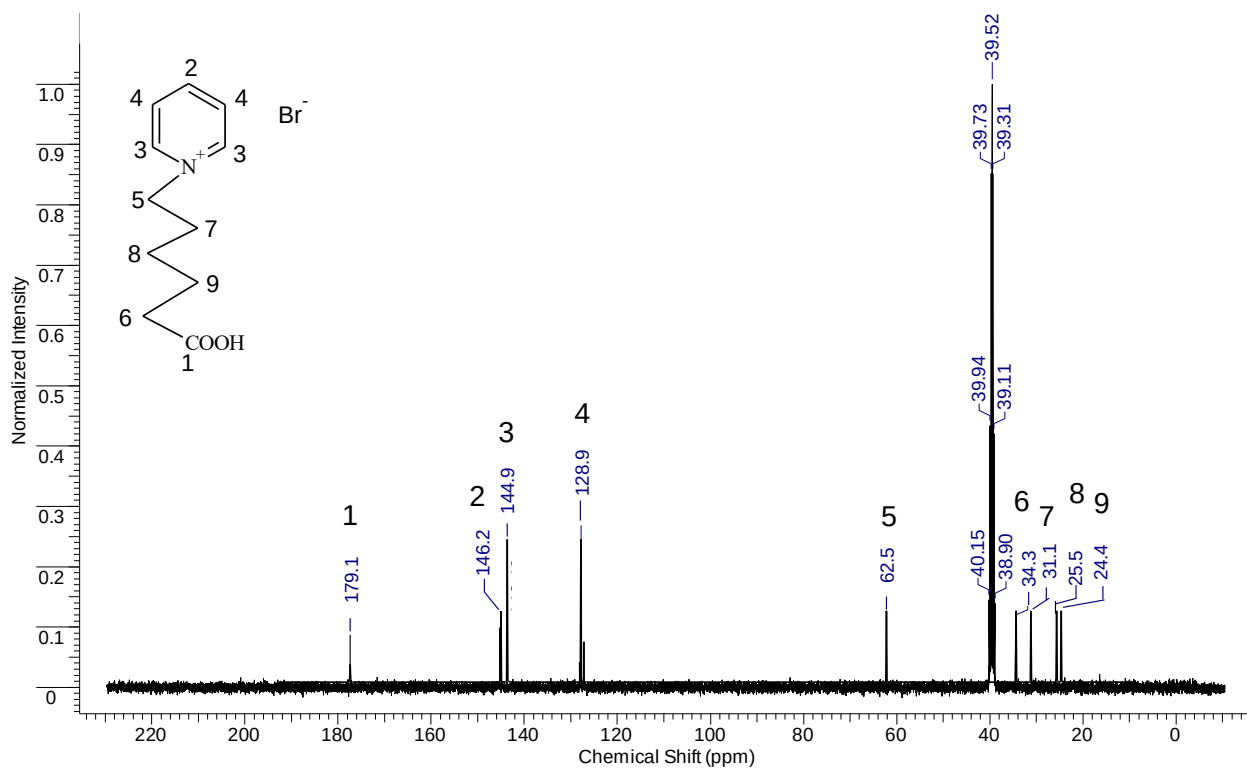


Figure 8. NMR ^{13}C spectra 1-(5-carboxypentyl) pyridinium bromide.

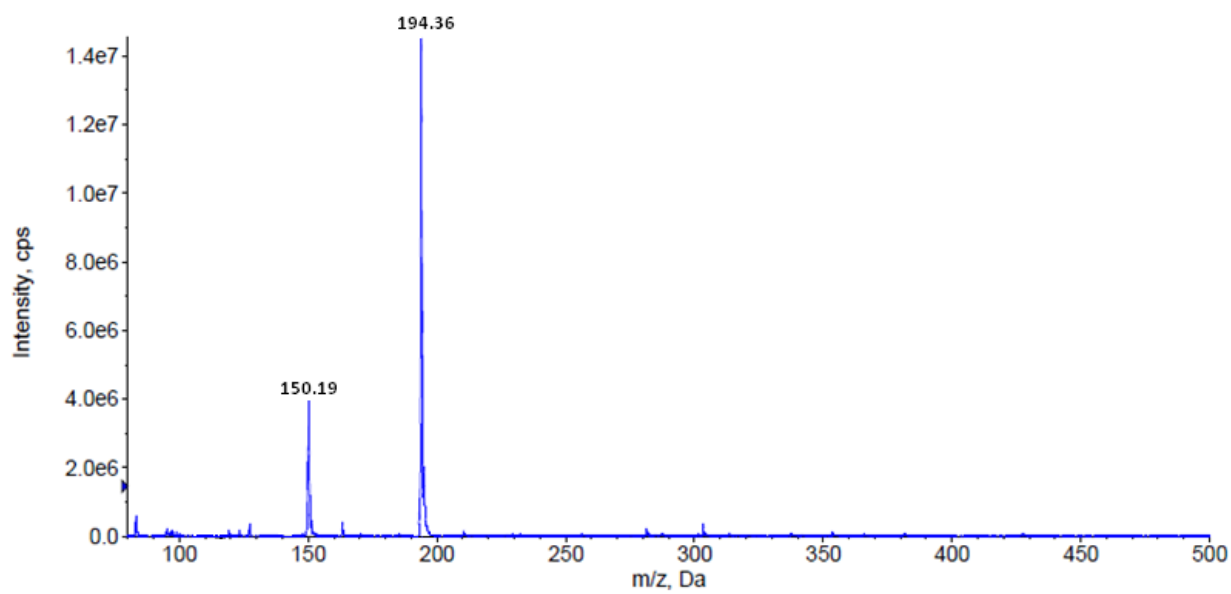


Figure 9. ESI-MS spectra 1-(5-carboxypentyl) pyridinium bromide.

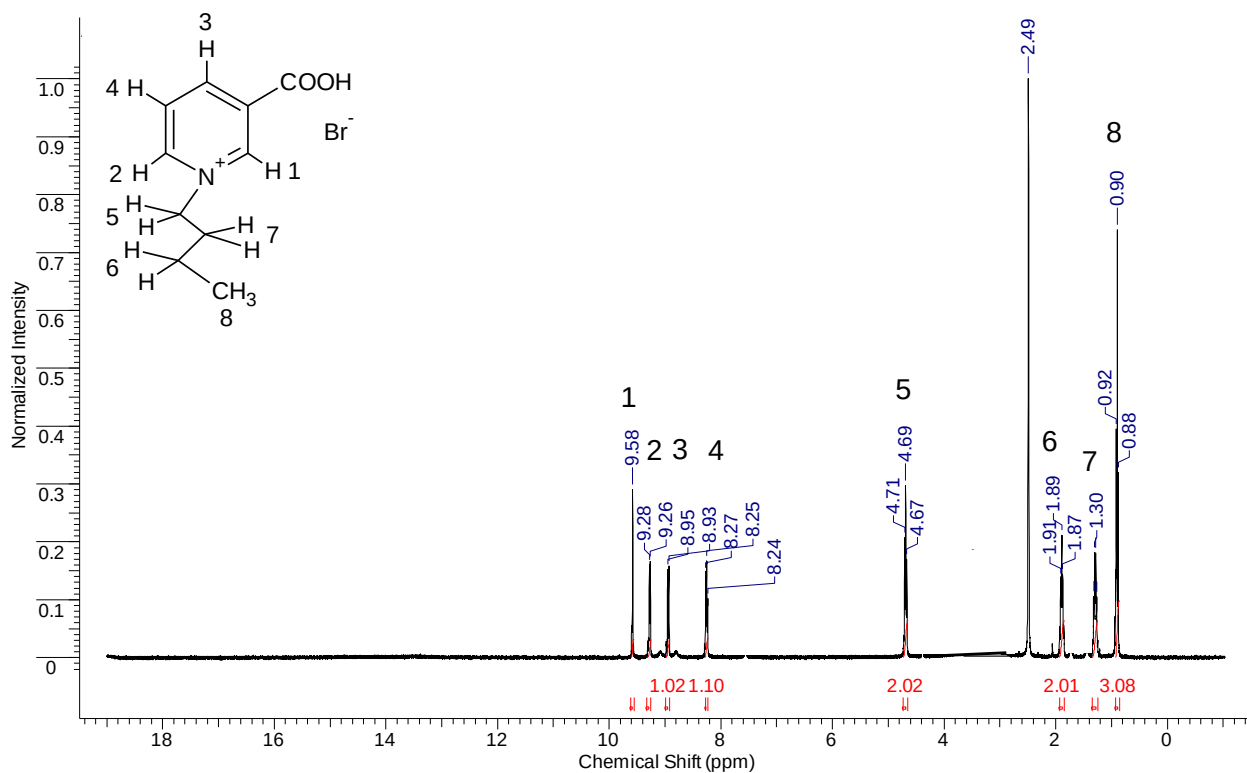


Figure 10. NMR ^1H spectra 1-butyl-3-carboxypyridinium bromide.

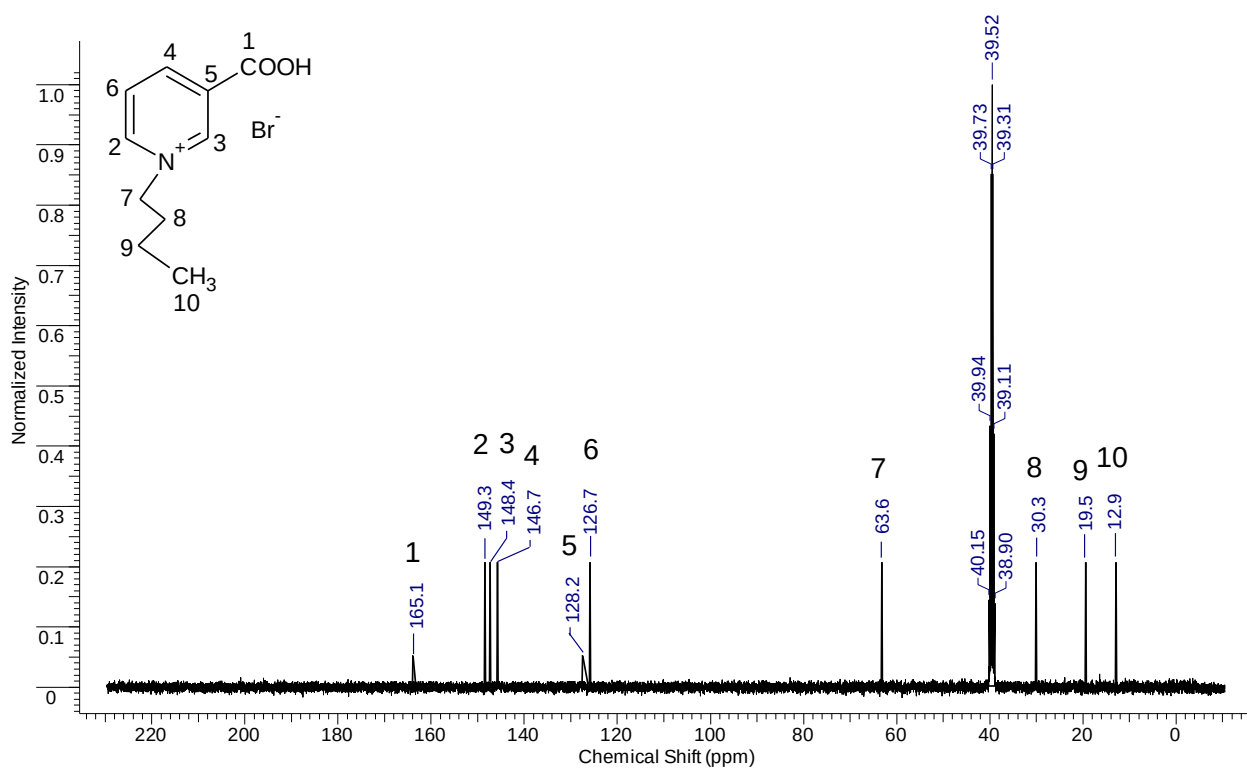
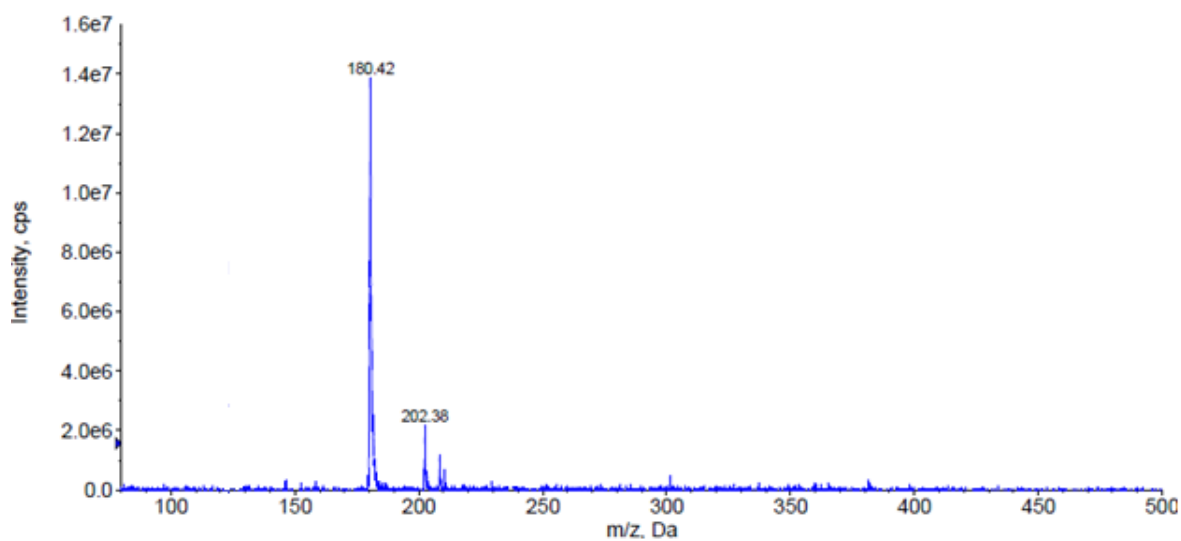
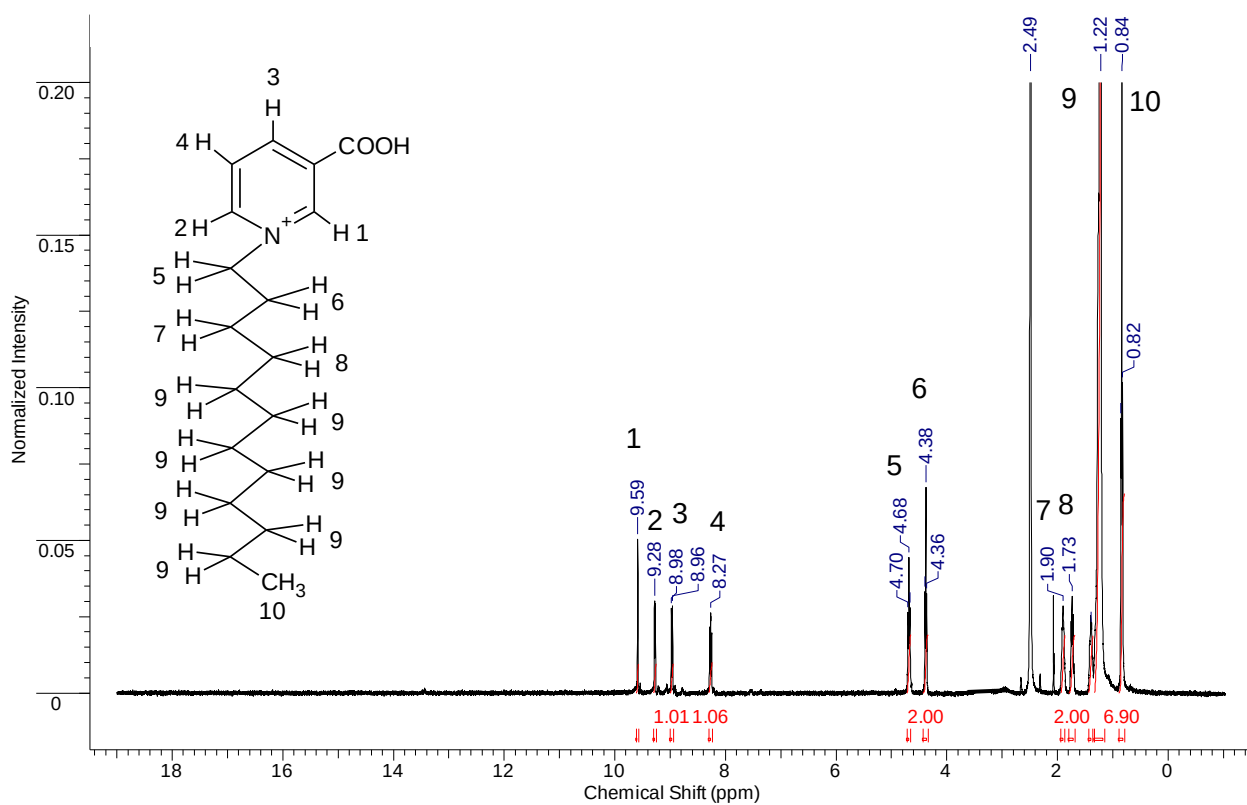


Figure 11. NMR ^{13}C spectra 1-butyl-3-carboxypyridinium bromide.



34

35 **Figure 12.** ESI-MS spectra 1-butyl-3-carboxypyridinium bromide.

36

37

Figure 13. NMR H^1 spectra 1-dodecyl-3-carboxypyridinium bromide

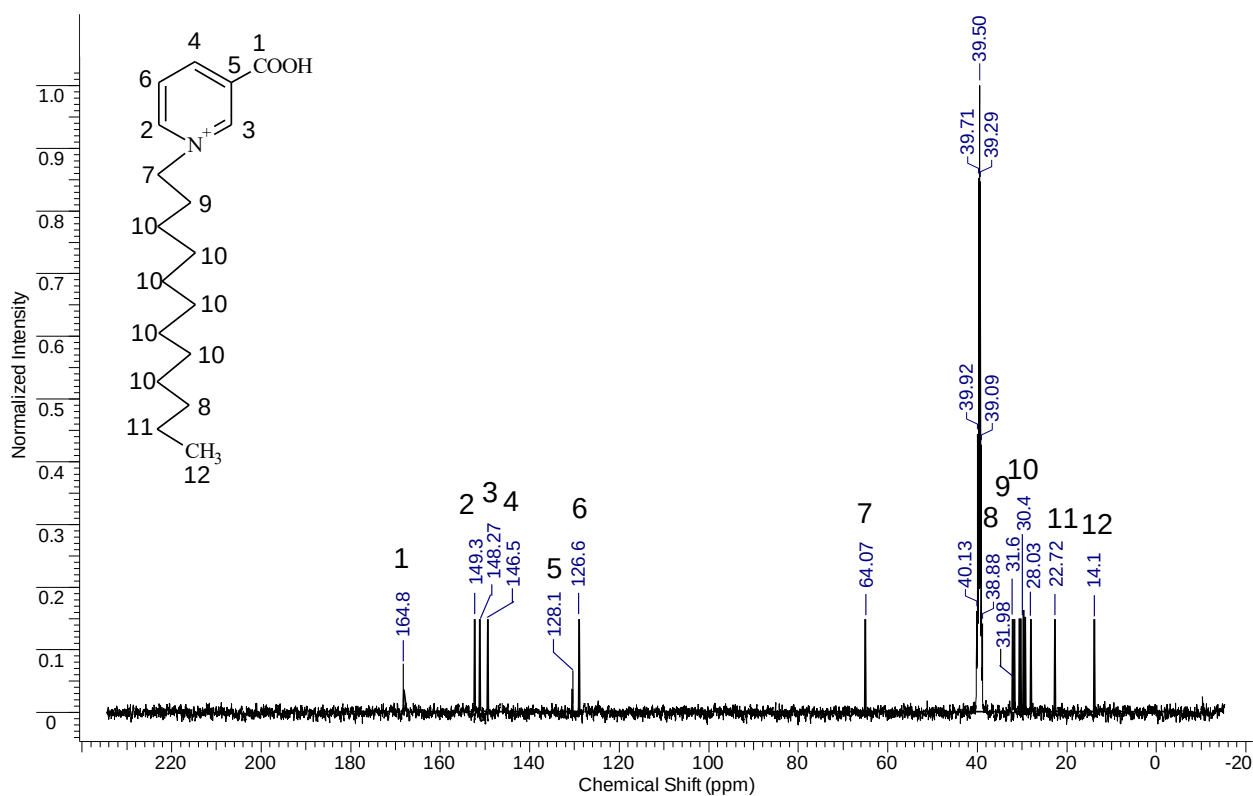


Figure 14. NMR ^{13}C spectra 1-dodecyl-3-carboxypyridinium bromide.

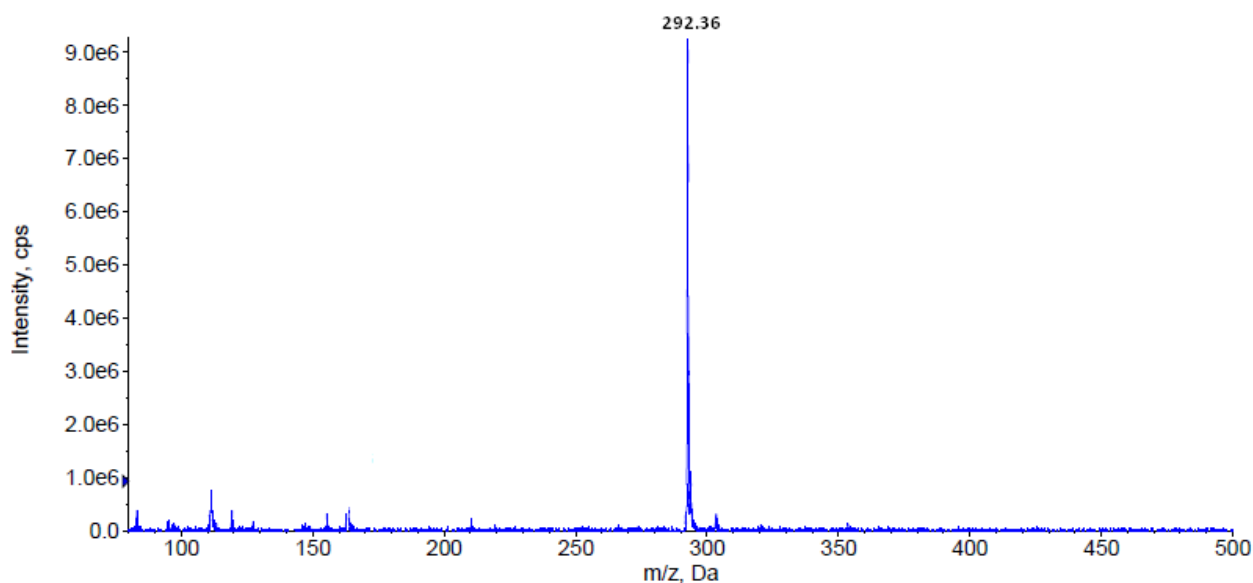


Figure 15. ESI-MS spectra 1-dodecyl-3-carboxypyridinium bromide.



© 2020 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).